

Claims

1. A biosensor comprising:
 - (i) a substrate comprising platinum or a platinum alloy;
 - (ii) a first layer formed on the substrate, the first layer comprising a sugar-derivative of a pyrrole; and
 - (iii) a second layer formed on the first layer, the second layer comprising an amphiphilic pyrrole and, within the second layer, one or more enzymes.
2. A biosensor according to claim 1, wherein the sugar-derivative of a pyrrole is a lactobionamide pyrrole.
3. A biosensor according to claim 1 or claim 2, wherein the amphiphilic pyrrole comprises a tertiary amine group.
4. A biosensor according to any preceding claim, wherein the substrate is platinum or a platinum-iridium alloy.
5. A biosensor according to any preceding claim comprising two or more different enzymes within the second layer.
6. A biosensor according to claim 5, wherein each enzyme is deposited as a separate layer within the second layer, so that the second layer comprises two or more sub-layers of different enzymes.
7. A biosensor according to claim 6, comprising at least two layers of each enzyme.
8. A biosensor according to any preceding claim comprising an oxidoreductase enzyme within the second layer.
9. A biosensor according to claim 8, wherein the oxidoreductase is xanthine oxidase.

10. A biosensor according to claim 9, additionally comprising nucleoside phosphorylase.
11. A biosensor according to claim 10, additionally comprising adenosine deaminase.
12. A biosensor according to claim 11, comprising a ratio adenosine deaminase : nucleoside phosphorylase : xanthine oxidase of approximately 1:1:5.
13. A biosensor according to claim 11, wherein the enzymes are deposited as separate sub-layers within the second layer, with xanthine oxidase deposited further away from the substrate than the nucleoside phosphorylase.
14. A biosensor according to claim 13, additionally comprising a layer of adenosine deaminase deposited closer to the substrate than the nucleoside phosphorylase.
15. A biosensor according to claim 13 or claim 14 comprising several layers of nucleoside phosphorylase and xanthine oxidase, and optionally adenosine deaminase.
16. A biosensor according to any preceding claim additionally comprising a reference electrode.
17. A kit for detecting the presence and/or concentration of a substance comprising a biosensor according to any preceding claim.
18. A method of producing a biosensor according to any one of claims 1 to 16, comprising the steps of:
 - (i) providing a substrate comprising platinum or a platinum alloy;
 - (ii) depositing a first layer comprising a sugar-derivative of a pyrrole; and
 - (iii) depositing a second layer, the second layer comprising an amphiphilic pyrrole and, within the second layer, one or more enzymes.

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19. A method according to claim 18, wherein the second layer comprises two or more different enzymes, each enzyme being deposited as one or more separate sub-layers to form the second layer.
20. A method according to claims 18 or 19, wherein the first layer comprises a lactobionic pyrrole and is deposited in a solution comprising acetonitrile.
21. Use of a biosensor according to claim 9 to detect the presence and/or concentration of xanthine.
22. Use of a biosensor according to claims 11 or 13 to detect xanthine or inosine.
23. Use of a biosensor according to claims 12 or 14 to detect one or more purines.
24. A method of detecting the amount of a substance within a tissue, comprising exposing a biosensor according to any one of claims 1 to 16 to a sample of tissue or body fluid *in vivo* or *in vitro*, and detecting an electrical current produced by the biosensor.
25. A method according to claim 24, wherein the tissue or body fluid is blood, brain, muscle, cardiac tissue, saliva or urine.
26. A method according to any preceding claim wherein the substance is adenosine.